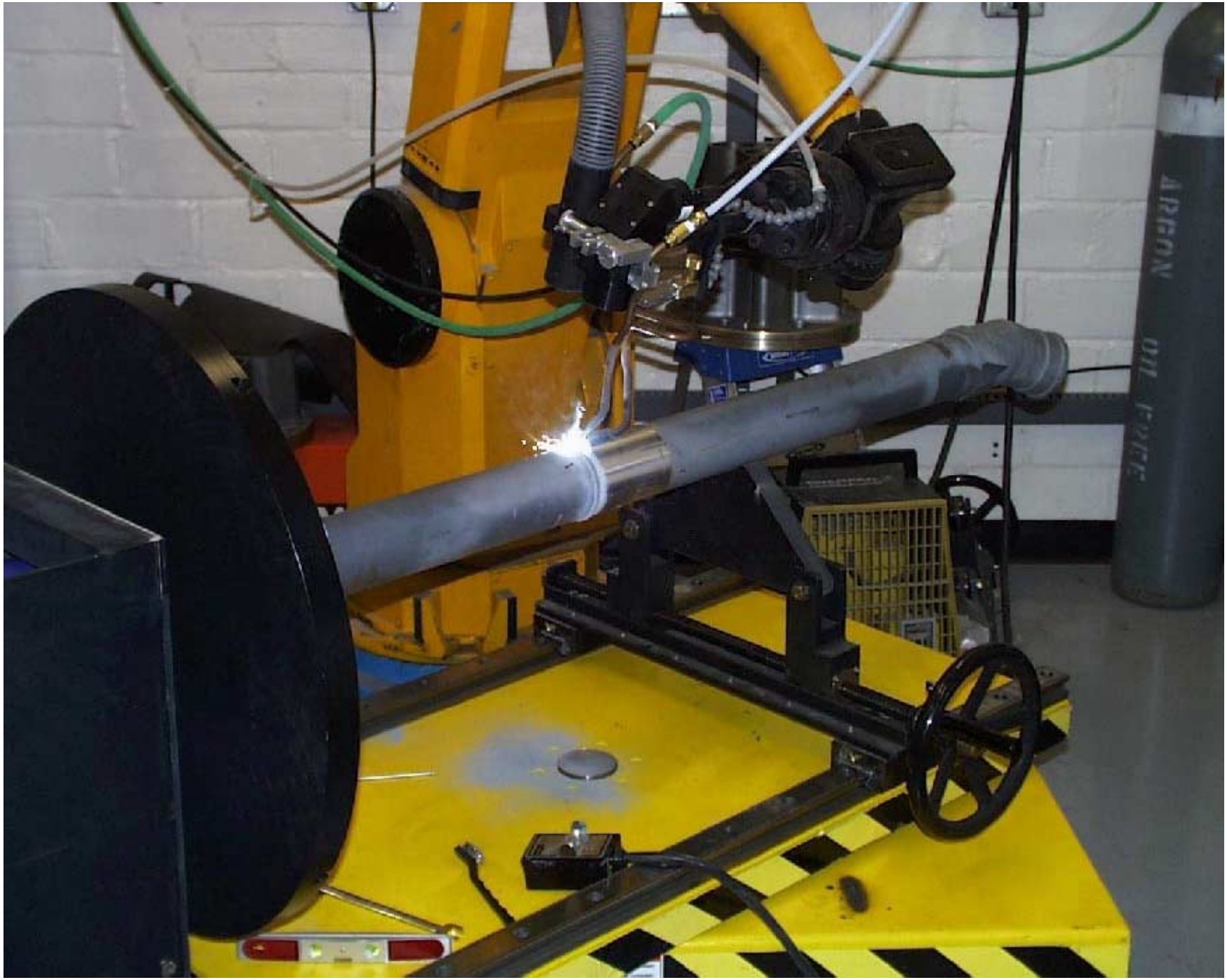
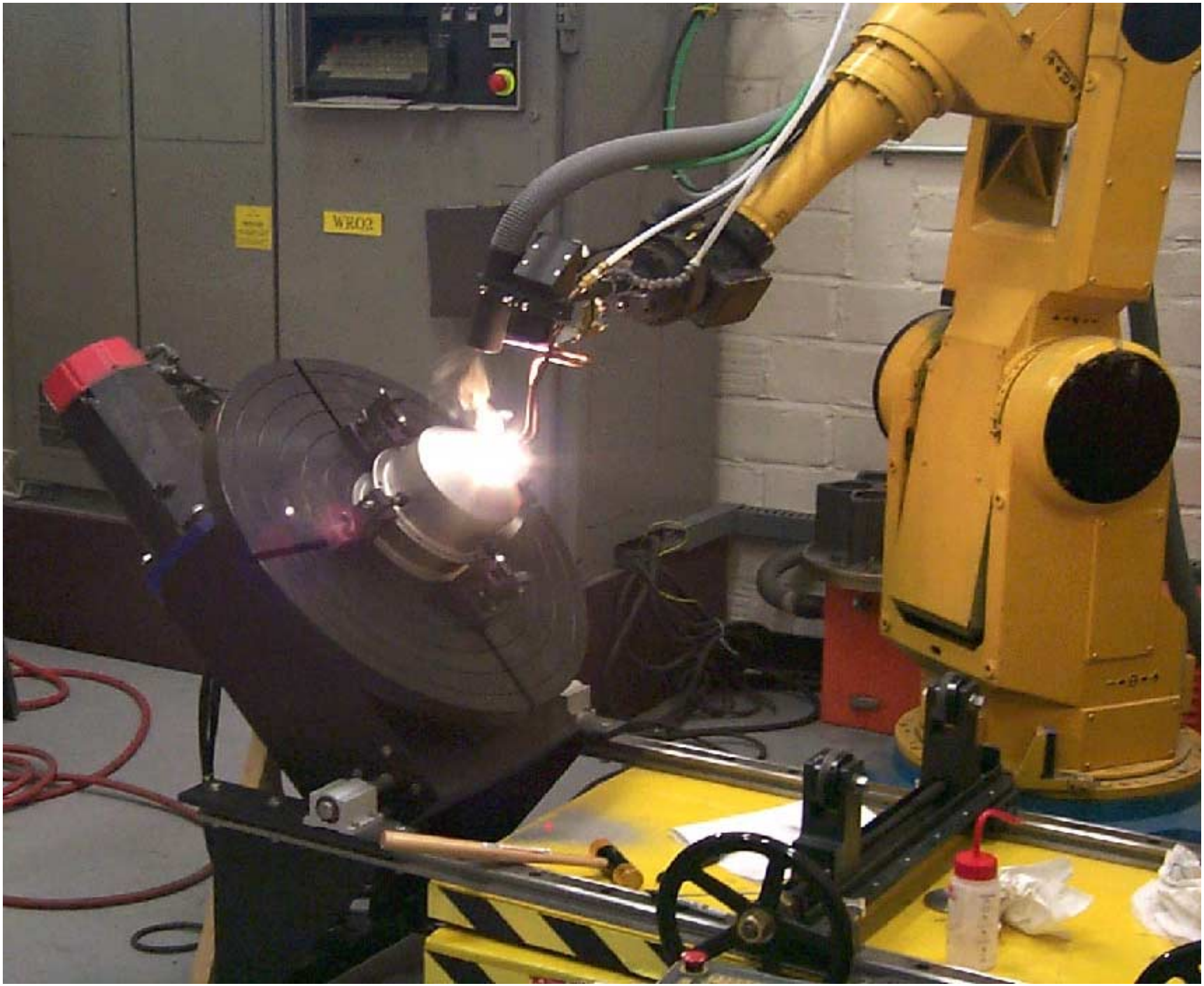
Laser Cladding Advantages

1/3 Heat Input of Welding

- Minimal Distorsion
- Small Heat Affected Zone
- Repairs Unweldable Aluminum Alloys

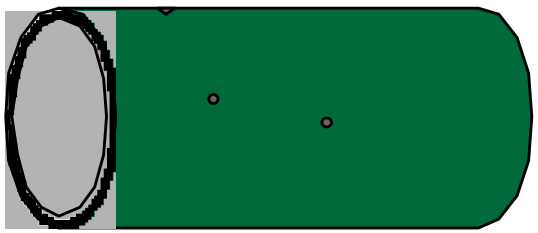
Aluminum Laser Clad Repair


ARGON

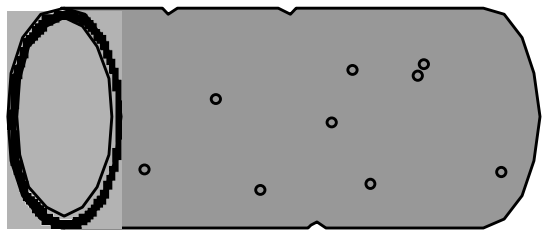

WR02

Torpedo Repair: Conventional Process

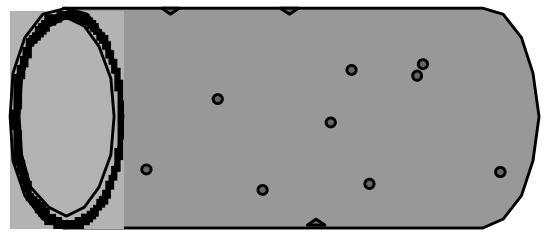
Damaged Component



Paint Removal (Sodium Bicarb Blasting)
Anodize removal(Chemical Stripping)

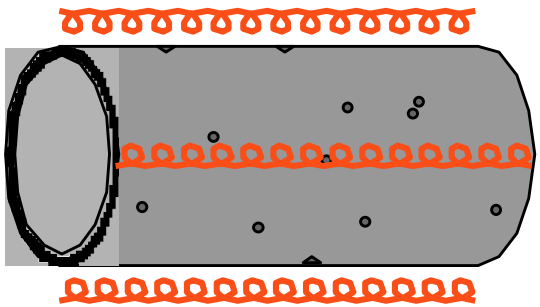


Belzona Repair



Repair old and new damage

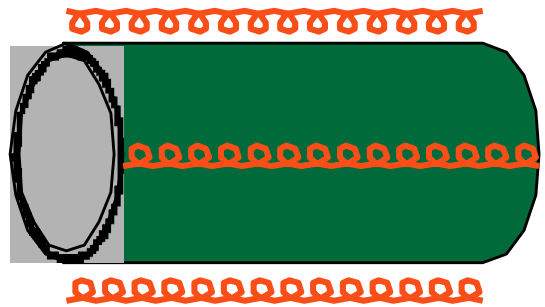
Reanodize (if necessary)
Paint Preheat



300°F 30 min.

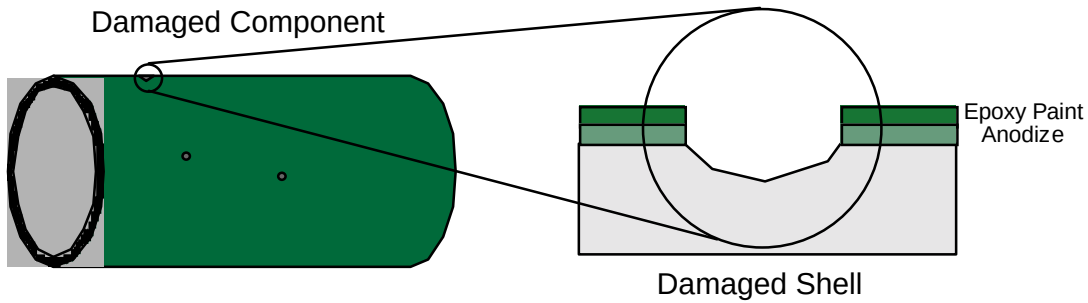
Powder Paint Application

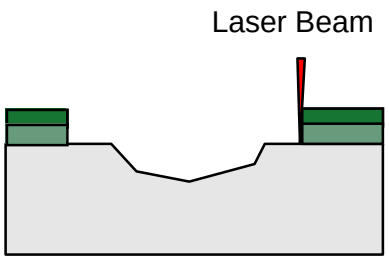
Paint Cure



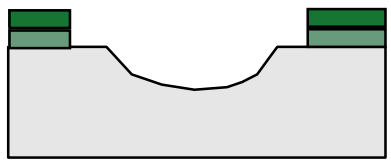
300°F 30 min.

Torpedo Repair: Laser Based Process

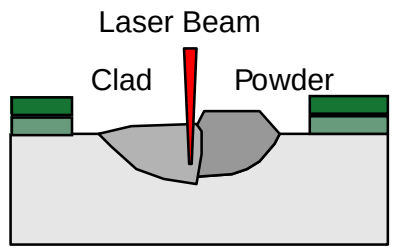




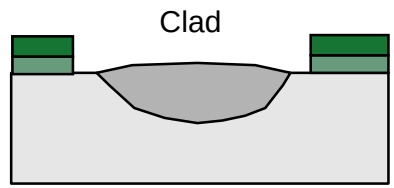
Laser Paint and Anodize Removal



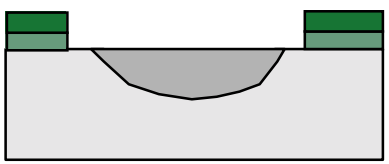
Cleaning and Clad Prep



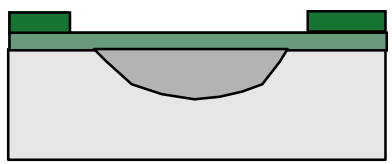
Laser Cladding



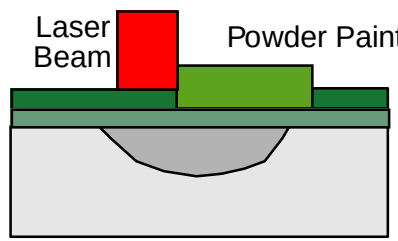
Completed Clad



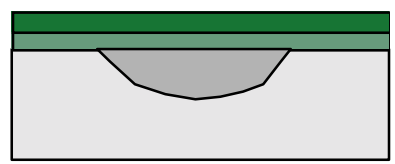
Machining



Selective Anodizing

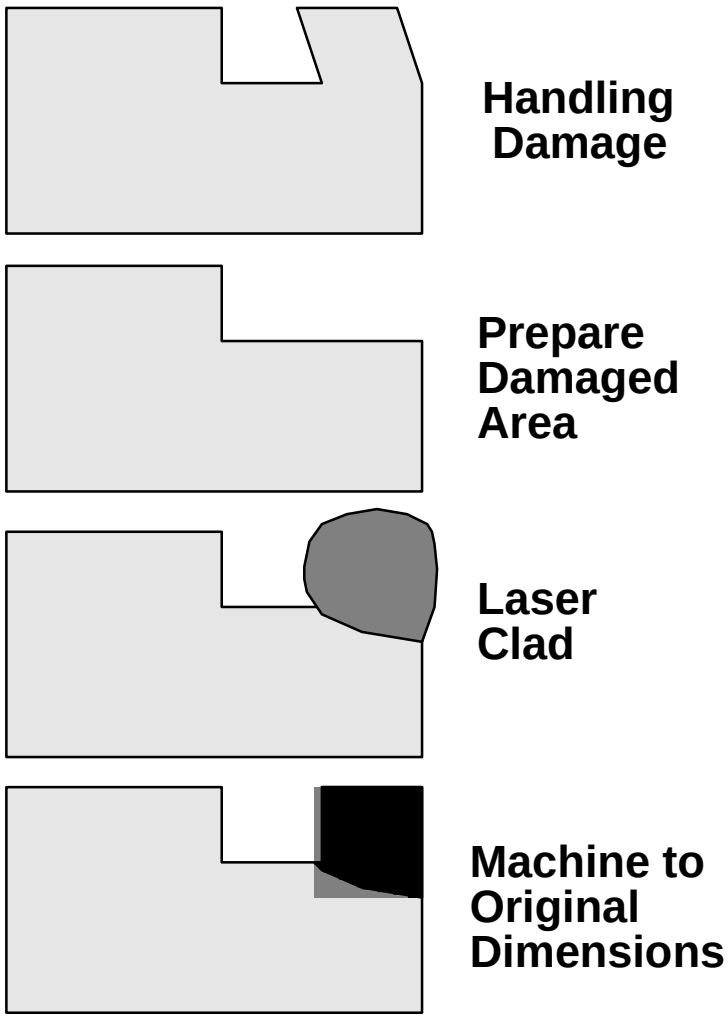


Paint Application and Curing



Completed Repair

Torpedo Repair: Edge Features

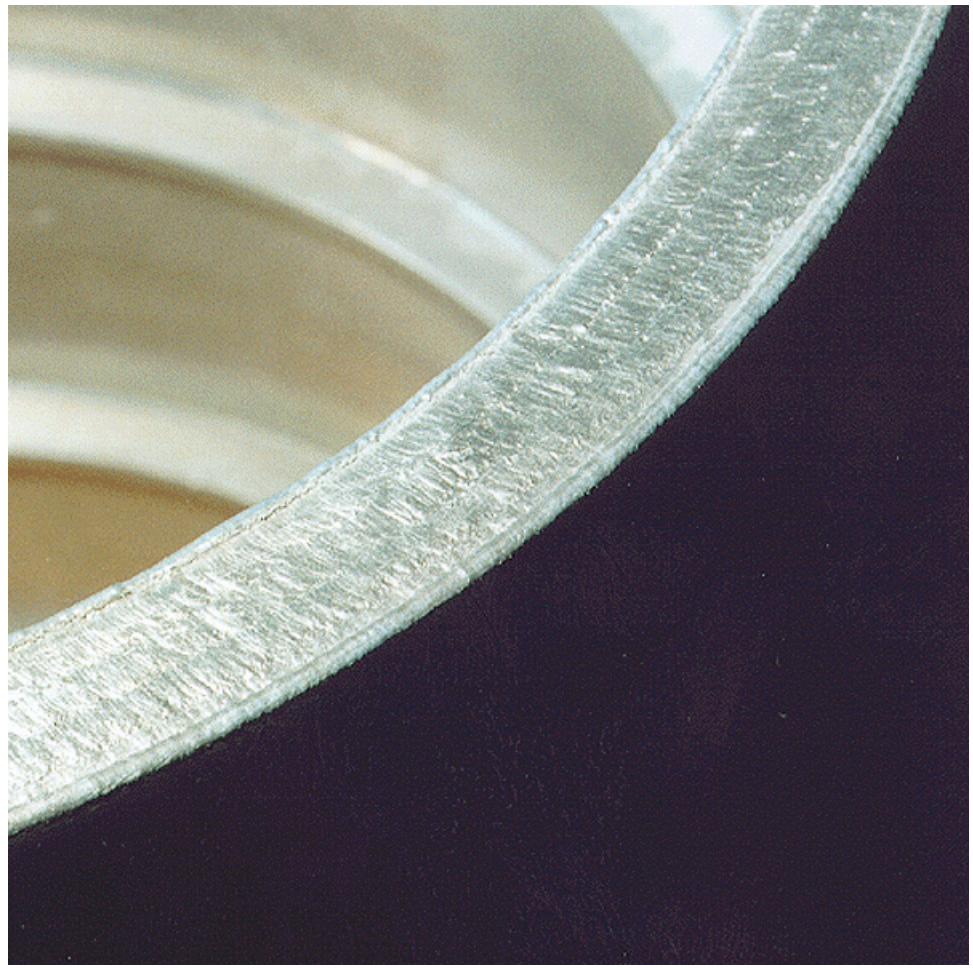


- Aft Fuel Tank damaged during handling
- 2 cm “dent” in O-ring seal
- No repair method exists
- Process developed and demonstrated on a scrap shell
- Damaged area removed
- Area built-up with powder
- Machined back to “original” dimensions
- Very little heat input, part able to be handled immediately after processing
- Aft Fuel Tank replacement cost
  - $65K
- Estimated cost of laser repair
  - $700 (labor, laser use, materials) doesn’t include machining and finishing costs

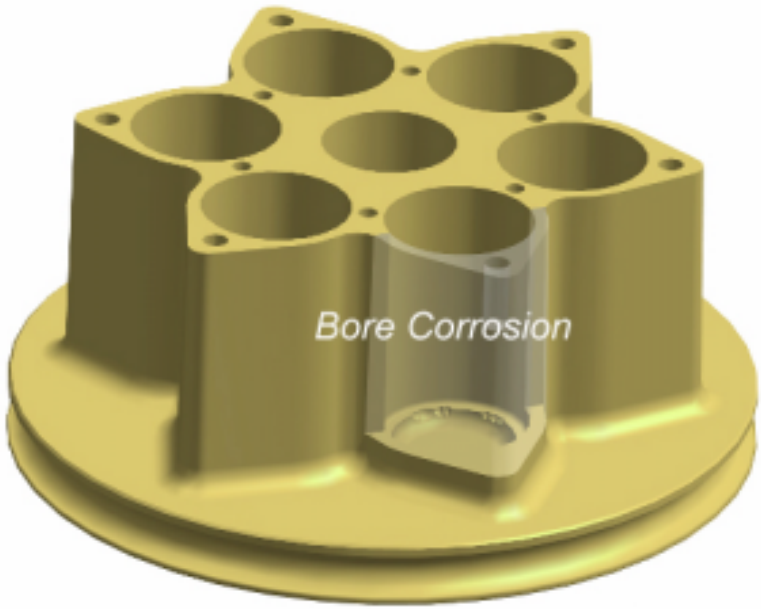
Torpedo Repair: Edge Features

- **Component was machined to required dimensions, has successfully passed hydrostatic testing, and the repaired area has been selectively anodized. After painting, it will be hydrotested again.**

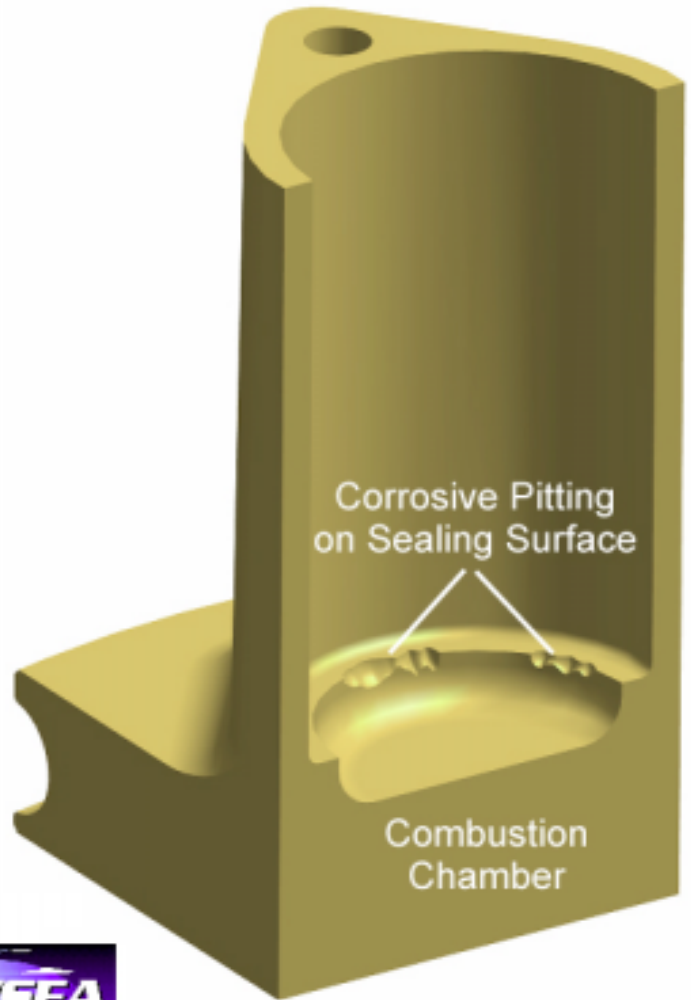
Torpedo Repair: Sealing Surfaces



Torpedo Repair: Cylinder Barrels

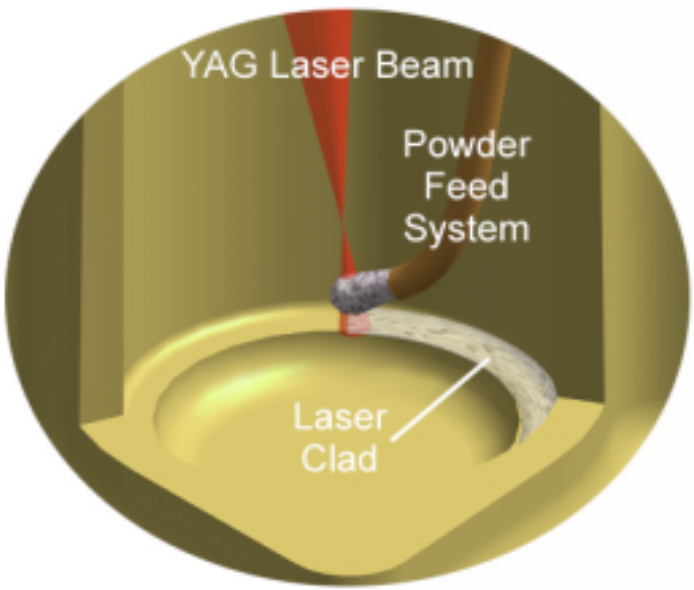


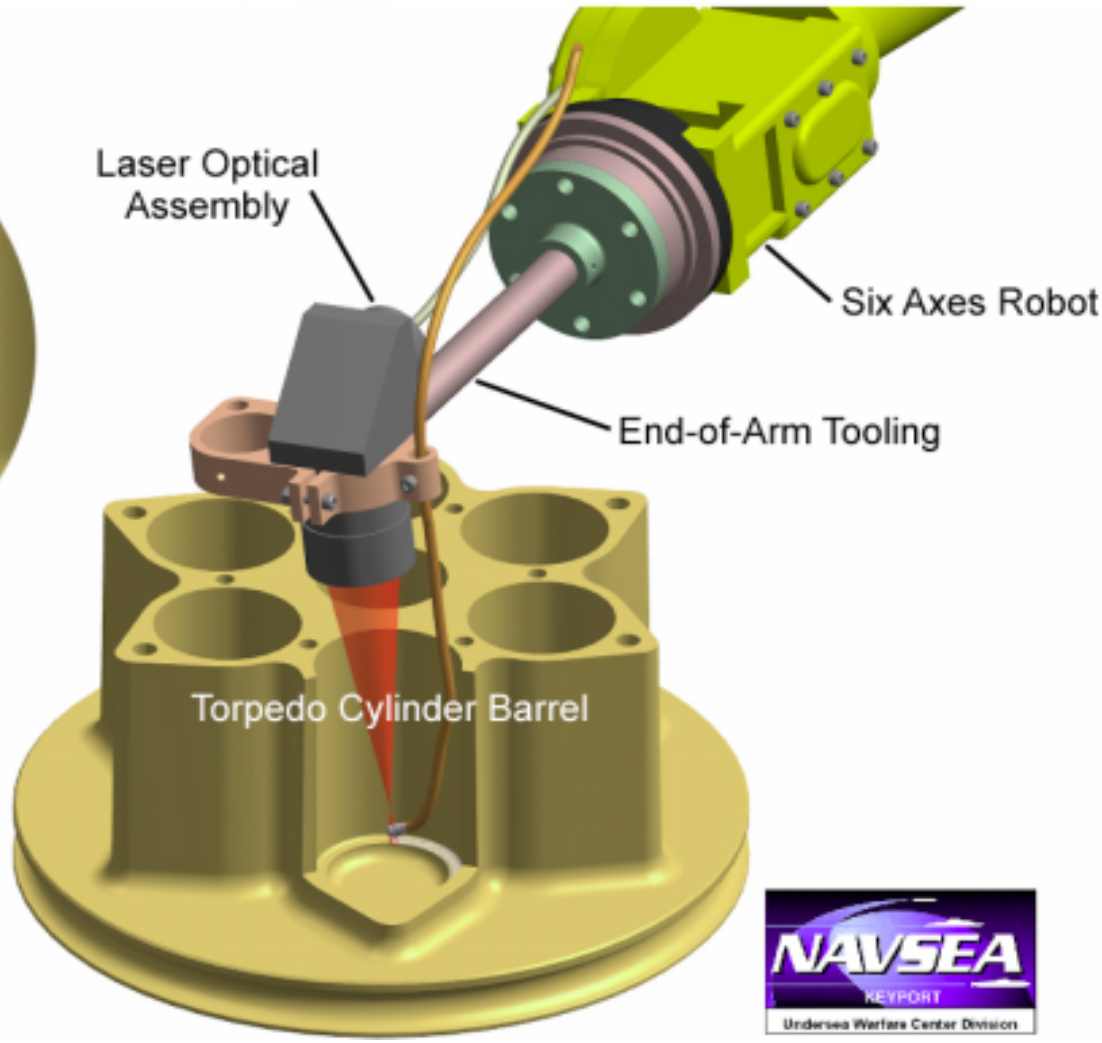
Heavyweight Cylinder Barrel Assembly
(Aluminum Forging 6061-T6)



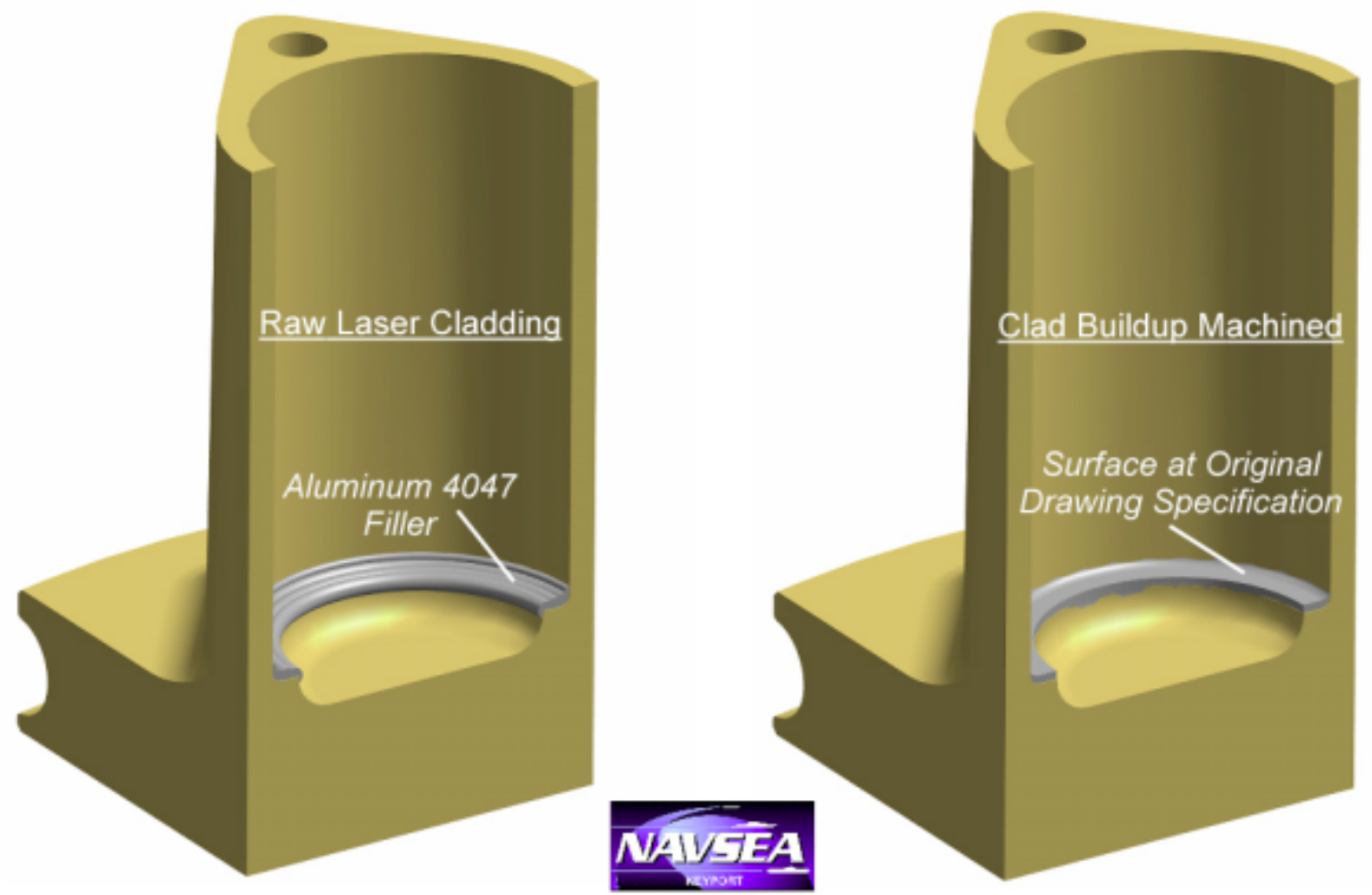
Cutaway Bore Section

Torpedo Repair: Cylinder Barrels





Torpedo Repair: Cylinder Barrels



Laser Cladding Savings

(Initial System Cost: $500K ----- Payback: 6 months)

Weapons System	Repaired Item	Material	Cost Savings
TRIDENT Tube	Bulkhead Connector	Inconel 625	$ 11,000
MK 48/ADCAP	FWD Fuel Tank	6061-T6	$ 11,000
	MK 6 Cylinder Barrels	6061-T6	$317,000
	AFT Fuel Tank	7175-T6	$ 65,000
Targets	FWD Tail Section	6061-T6	$ 75,000
	Battery Section	6061-T6	$175,000
	Nose Section	6061-T6	$ 25,000
	Hydrophone Shells	Cast Stainless	$ 43,000

TOTAL SAVINGS = $722,000

Future Laser Processing Facility